AIR FORCE MATERIEL COMMAND

- Leading the Way in Aerospace Research
- Meeting the Nation's Defense Requirements
- Supplying the Warfighter's Needs

On February 10, 1908, the newly established Aeronautical Division of the Signal Corps accepted the Wright brothers' bid to provide the Army with its first heavier-than-air flying machine. Although the endurance and speed trials in 1908 ended in the tragic death of Lt Thomas Selfridge, and the injury of Orville Wright, the resumption of the trials in 1909 concluded with the acceptance by the Army of its first military aircraft. Here Orville Wright is airborne at the controls. The nearness of the buildings surrounding the drill grounds constrained straight flight.

The Wrights produced an improved version of the Military Flyer in 1909. Overall design changes included a combination of a front movable rudder with a fixed horizontal place in the rear of the machine in contrast to a front rudder in models. Here soldiers prepared the aircraft outside of a hangar at Fort Myer.

Ida Holgrove at work in the sewing department, Wright Company, Dayton, Ohio, 1911

On October 1, 1917, the Signal Corps' Aviation Section selected a site north of Dayton for an aviation engineering and experimental test facility. The facility was named McCook Field after a Dayton family of Civil War heroes. Here stress testing of airplane components was conducted by loading sandbags onto the surfaces of the wings, tail, and other sections of the fuselage.

With McCook Field originally established as a temporary experimental site for wartime testing, the Army Air Service was soon looking for a permanent for the Engineering Division. Faced with the possibility that it might be moved to Langley Field in Virginia, a group of prominent Dayton, Ohio businessmen formed the Dayton Air Service Committee to keep the continuing development of military aviation at Dayton. They raised enough money to secure 4,988 acres and deeded it to the Air Service in August 1924. Here is the Engineering Division at Wright Field as it appeared on June 3, 1927.

The largest airplane associated with McCook Field was the 42,000 lb XNBL-1 Barling bomber of 1923. Brig Gen William "Billy" Mitchell, the colorful, farsighted Assistant Chief of the Air Service, recruited Walter J. Barling, Jr. to design and build an airplane that could carry bombs big enough to sink a heavily armored battleship.

A Wright Model B military flyer outfitted with the first airborne radio transmitter. The metal drum contained the antenna wire, which was wound out to extend beyond the aircraft while it was in flight.

One of most important areas of was human physiology in high speed, high altitude environment of flight. One area focused on the testing of the human body's behavior under the stress of rapid acceleration and deceleration. Centrifuges were constructed to test multiple gravity (g) loads on pilots. Shown here is the first centrifuge in the U.S, at Wright Field in 1936.

The Flying Branch at Wright Field conducted all authorized flight testing of experimental airplanes, engines, aircraft accessories and miscellaneous equipment. Branch pilots supported a variety of missions including night missions to test landing gear and flares, and day missions to test aerial photography.

Wright Fielders pioneered U.S. efforts to develop reliable radio equipment for aircraft. Shown here is a Ford C-4 Trimotor conducting radio communications experiments in the early 1930's.

This ejection seat test was conducted during the development of the X-15 rocket-powered aircraft.

Here an aeromedicaler is wearing a protective T-1 partial pressure suit. This test showed that at very high altitudes (above 60,000 feet), water will boil at room temperature.

To study the effects of "g" forces on the human body, Lt. Col. Dr. John P. Stapp and his team of aeromedical ers used rocket sleds. Prior to these studies, many physicians maintained that humans could safely endure no more than about 18 instantaneous "g's." Using himself as the test subject, Stapp ultimately proved that, when properly restrained, the human body is remarkably resilient. On June 1, 1951, he actually survived a 48-g deceleration.

On August 16, 1960, Capt Joseph W. Kittinger jumped from a balloon-supported gondola at an altitude of 102,800 feet, setting a world's record. This, a part of Project Excelsior, helped to establish the human capability to safely eject from aircraft at very high altitudes.

The first organized in engineering psychology began in the Aerospace medical Laboratory in 1945. The experiences of World War II had demonstrated a need for human engineering in the design of aircraft equipment, training procedures, and aircrew combat training in emergency situations. A specially outfitted C-47 was used as a flying laboratory to study pilot orientation in the cockpit.

On 27 August 1946 Corporal Harry J. Brickheimer (shown here) became the second American to use an ejection seat to bail out of an airplane. The first, Sergeant Lawrence Lambert, had performed this feat just ten days earlier.

Shown here is the rocket-powered Bell X-1 and its NB-29 "mothership." On 14 October 1947, while piloting the X-1 over Muroc Dry Lake, California, USAF Capt Chuck Yeager became the first human to fly faster than the speed of sound.

Wright Field engineers conducted structural test on many aircraft during the Cold War. Here, in 1957, a B-58 Hustler air frame is prepared for structural analysis studies.

When human beings first took to the air, one of the primary concerns was the affect that weather could have on their airplanes. For example, icing on aircraft wings adversely affects flight characteristics by increasing drag, decreasing lift, and causing control problems. Starting in 1948, the Flight Test Division used a C-54 transport with a propeller icing rig installed to generate aircraft icing on test aircraft.

Experimental rocket planes expanded the boundaries of the high-speed and stratospheric frontiers. Here Major Chuck Yeager (top) and Major Kit Murray pose following record flights in the X-1A.

Making its initial flight in August 1973, the X-24B became the first lifting body aircraft to make a landing on a conventional runway. Shown here on the dry lake bed at Edwards AFB, California, the X-24B contributed to the final design of the space shuttle.

The North American X-15 rocket plane reached a maximum speed of Mach 6.7 and a maximum altitude of 354,200 feet. Looking at it another way, Mach 6 is about one mile per second, and flight above 265,000 feet qualifies an Air Force pilot for astronaut wings. Eight pilots earned that distinction while flying the X-15.

The Advanced Fighter Technology Integration (AFTI) F-16 was a very successful flight demonstration program. Beginning in 1978, nearly every new or derivative U.S. military aircraft benefited from the advanced technologies flight-tested on the AFTI F-16.

The Air Force possesses many of the world's most sophisticated and unique aerospace test facilities. This photograph shows an F-16 model in the 16-foot transonic wind tunnel at the Arnold Engineering and Development Center.

This multi-axis device supports radar reflectivity studies using a model of a KC-135 tanker-cargo aircraft.

USAF Missile systems undergo constant upgrading and testing to demonstrate that they can meet evolving threats, and to prove their reliability. Shown here is a Minuteman III missile test launch from Vandenberg Air Force Base, California.

This photograph depicts an F-16 undergoing antenna measurement testing atop the Air Force Laboratory's aircraft pedestal at Newport, New York.

The Air Force conducts bioacoustics at the Air Force Laboratory's Aural Displays and Bioacoustics Branch located at Wright-Patterson Air Force Base.

Pictured here is an EF-111 suspended in the Benefield Anechoic Facility at Edwards Air Force Base, California. This facility is used for radio frequency emission testing.

Pictured here are a wind tunnel model of the GBU-15 glide bomb and an image of the same weapon showing computer-generated air flow pressure patterns. Scientists and engineers at the Air Force Laboratory use computational fluid dynamics to predict aerodynamic and thermal stresses on a wide variety of test shapes.

Missiles, such as the Minuteman shown here, were developed in the late 1950s by Air and Development Command, a predecessor organization to Air Force Materiel Command. The boosters were maintained by the Ogden Air Logistics Center, Utah, and the guidance systems were modified and calibrated at the Aerospace Guidance and Metrology Center, Newark, Ohio.

The complexity of modern jet fighter cockpits is shown here. The "heads-up display" at the top of the control panel provides critical flight data. Without it, the pilot would need to break eye contact with important external visual cues during critical maneuvers.

The January 29, 2003 launch from Cape Canaveral of the Air Force Delta II rocket, carrying Air Force Laboratory's (AFRL) XSS-10 micro-satellite as payload. This 60 pound micro-satellite, developed by the AFRL Space Vehicles Directorate had a 24-hour mission to conduct on-orbit servicing of the Delta II. It is the first in a series of future micro-satellites the Air Force plans to use for inspection, rendezvous, docking, and close-up maneuvering around other space objects.

Digital electronics made it possible to begin exploring the potential of fully integrated flight and engine control systems which offered tactical benefits by vectoring engine thrust. The F-15 Short Take Off and Landing (STOL) /Maneuvering Technology Demonstrator (MTD) was modified with two-dimensional thrust vector-and-reversing nozzles, an autonomous landing guidance system, and forward mounted canard surfaces.

In every conflict since World War II, the United States has shown the ability to decisively defeat its adversaries in air-to-air combat. The acquisition of the F/A-22 fighter will ensure that the Air Force retains this capability into the coming decades.

Ballistic missiles have developed into a major threat to the security of the United States. When operational, the ABL-1 Airborne Laser aircraft will give the USAF the capability to destroy ballistic missiles in their boost phase from hundreds of miles away.

The USAF has the unique ability to observe in great detail the territory, disposition and movement of enemy forces. The acquisition of the long-range RQ-4 Global Hawk unmanned surveillance aircraft has greatly enhanced the Air Force's ability to accomplish this mission.

With the entry of the United States into World War I, Camp Kelly in San Antonio, Texas, became Kelly Field, named after Lieutenant George Kelly, the first American pilot to die in a military airplane crash. In addition to training new recruits as pilots, Kelly Field was the site of a major supply depot. Shown here is a stock room for the Engine Department at Kelly Field in the early 1920's

Less than a week after the United Stated entered World War I, the Dayton-Wright Airplane Company was organized. Located at Moraine City, south of Dayton, the new company began manufacturing DeHavilland DH-4 two-place biplanes.

By the end of 1918 the Dayton-Wright Airplane Company had manufactured about 3,100 of the total 4,500 DeHavilland DH-4s built in the United States. Here fuselages await their wings in August 1918.

In December 1926, the Chief of the Materiel Division made the four districts of the Procurement Section responsible for the inspection of all Air Corps items manufactured in the United States. The Dayton district was moved from McCook Field to Wright Field in early 1927.

During 1934 the Materiel Division began efforts to develop a medium-range bomber. General called for a multi-engine aircraft capable of carrying 2,000 lbs of bombs over 2,000 miles at a speed of at least 200 mph. On July 28, 1935, the Boeing's Model 299, made its maiden flight at Boeing Field near Seattle. Model 299 would go on to be the famous B-17. Its five gun emplacements won the bomber the nickname of "Flying Fortress."

World War I aircraft were relatively simple machines made of wire-braced wood. Early post-war aircraft designs experimented with welded metal air frames. Depicted here is a Liberty Engine-powered Boeing-modified version of the DeHavilland DH-4B, minus its wings and fabric covering.

The XB-19 "Hemisphere Defender" was enormous. With a wingspan of 212 feet, a length of 132 feet, and a gross weight of over 140,000 lbs, it was the largest aircraft ever built in the U.S. when it made its first flight on 27 June 1941.

The Dayton-Wright Company produced nearly three-fourths of the more than 4,500 British-designed DH-4 airplanes manufactured in the United States between 1917-1918. These airplanes were equipped with an American designed and built Liberty 8-cylinder and 12-cylinder engines.

Piston engine development advanced significantly during World War II. Shown here is an assembly line for Wright R-3350 Duplex Cyclone, 18-cylinder, air-cooled, radial engines. The post-war introduction of gas turbines soon rendered such large complex piston engines obsolete for military use.

American factories produced hundreds of thousands of aircraft over the course of World War II. Pictured here is a Martin Aircraft B-26 medium bomber assembly plant.

World War II production model bomber development reached its zenith with the Boeing B-29. Shown here are two factory workers putting the finishing touches on a B-29 engine nacelle.

The Area C flightline was an active center of operations in the early 1950's, especially with the advent of more advanced jet aircraft like the B-47.

A KC-135 Stratotanker refuels a B-52 Stratofortress. In the early 1960s these two aircraft formed the backbone of the Strategic Air Command's nuclear deterrent force.

Tactical reconnaissance aircraft provide important intelligence information for military operations. These USAF maintainers are shown working on an RF-101G "Voodoo" aircraft in late 1960s.

An image showing the evolution of the Boeing B-47 "Stratojet" medium bomber. The first design concept (late 1944) is on the upper left. The final design (late 1945) is in the center.

Aerial refueling provided tactical jet aircraft with the ability to conduct long-range operations. Here, an RF-84G Thunderjet is "gassed up" during a transatlantic crossing in the 1950s.

The liquid-fueled HGM-25 Titan I was the second US intercontinental ballistic missile to enter operational service. Follow-on versions of the Titan became important launch vehicles in the U.S. space program.

A Boeing B-47 Stratojet uses jet-assisted take-off rockets to become airborne in a short distance. Over 2,000 B-47s were built for the USAF between 1947 and 1957.

A two-seat version of the F-100 Supersabre, the F-100F (shown here in production) served during the Vietnam War. Called "Wild Weasals," F-100F aircrews played deadly "cat and mouse" games with enemy surface-to-air missile launchers.

Carried aboard the B-52G Stratofortress, the AGM-28 "Hound Dog" became operational in 1961 and served until 1976 as a stand-off ground attack missile.

The SM-65 Atlas intercontinental ballistic missile became operational in late 1959. Other versions of the Atlas became important launch vehicles for early U.S. spacecraft.

Manufacturing processes used to build modern combat aircraft are extremely complex. Here is the molding machine used to make the canopy for the F/A-22 Raptor fighter aircraft.

F-15 Eagle air superiority fighters under construction. The F-15 first entered operational service in 1976.

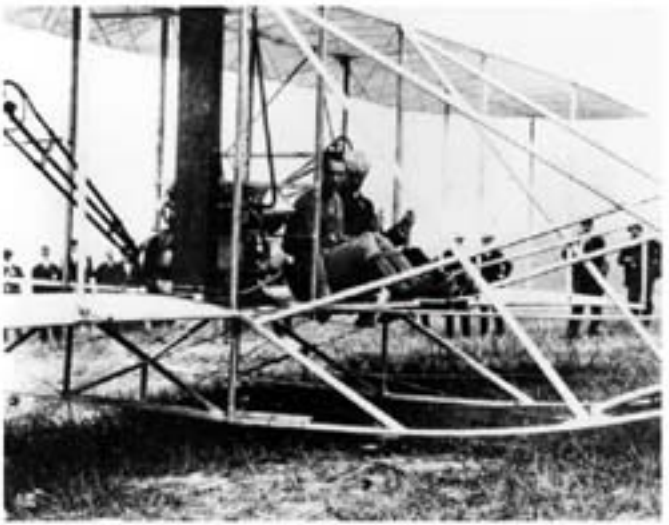
F-15 Eagle air superiority fighters under construction. In service with the USAF and the air forces of four allied nations, the Eagle has never been defeated in air-to-air combat.

The F/A-22 Raptor will be the USAF's primary air superiority fighter in the early 21st century. Its "supercruise" capacity allows it to fly faster than the speed of sound (Mach 1) without using fuel-consuming afterburners.

The AGM-86 air-launched cruise missile entered USAF service in 1981. During the Persian Gulf War (1990-1991), USAF B-52H bombers launched numerous AGM-86s against critical targets in Iraq.

Modern jet engine design combines very high thrust output with extreme durability and ease of maintenance. Rigorous testing assures performance can be met under all operating conditions.

Shown here is the C-17 production line in Long Beach, California. Since entering operational service in 1993, over 100 C-17 Globemaster III transports have been delivered to the USAF's Air Mobility Command.



According to one observer, "when the official flight trials at Fort Myer began, the public journeyed there by the thousands to see the mystery of flight dissolved and the skeptics, at last, proved wrong." Here Orville Wright and Lt Thomas Selfridge, a member of the trial evaluation committee, prepare for takeoff on September 17, 1908.

Soldiers and others remove the Wright Model A Flyer from the balloon tent in preparation of the flight trials at Fort Myer, Virginia, September 1908.

The 1st Aero Squadron served as the air element in General John Pershing's Punitive Expedition against Pancho Villa in the spring of 1916. Here aircraft mechanics ponder repairs to a crash-landed Curtiss observation plane.

Early airmen had to improvise for flight clothing and protective head gear. Even seat belts had to be invented – the first airplanes did not have them.

Two airmen of the 1st Aero Squadron prepare for a re-supply mission. Northern Mexico's harsh operating environment was especially difficult for the squadron's primitive "wood and wire" aircraft.

On August 1, 1907, the Aeronautical Division was established in the Office of the Chief Signal Officer of the Army. The Division was put in charge "of all matters pertaining to military ballooning, air machines, and all kindred subjects on hand." Selected for his experience in free balloon operations, Corporal Edward Ward (center) poses with fellow crewmen around the gondola of a Signal Corps balloon.

Curtiss JN-3 observation aircraft of the 1st Aero Squadron were used during the Pershing Punitive Expedition to Mexico in the spring of 1916.

Following Pancho Villa back into Mexico, the 1st Aero Squadron's aircraft were often rendered ineffective by their inability to operate in northern Mexico's extreme weather and high altitude.

Early air cargo loading provisions were primitive. Here, oil and aviation gasoline are loaded for movement aboard a Douglas C-2 transport of the late 1920's.

Following World War II, of all the elements in the logistics function, information flow was probably the slowest and most unwieldy. The information processing work load had multiplied, yet the work force handling it had shrunk by some 55 percent between 1945 and 1955. With over 41 million stock items to account for, the Air Force was still forced to post stock records manually in the early 1950's.

During World War II, manpower shortages encouraged women to support operations on "the front."

During World War II, women worked at the Fairfield Air Depot at Wright-Patterson Field repairing engines for combat aircraft.

During the Vietnam conflict, close air support aircraft such as this A-1E Skyraider often escorted aircrew rescue helicopters to provide protection against enemy ground forces.

Airlift was an integral part of missile logistics, even to the extent of airlifting the strategic missiles themselves. The C-133 could accept either the Atlas (shown) or Thor missile.

A P-51 Mustang fighter, taped and ready for overseas shipment. The tape was used to cover cracks and seams, before application of a plastic coating to protect the aircraft against humidity.

Shown here is maintenance being performed on an Atlas intercontinental ballistic missile. The first Atlas squadron reached initial operational capability in 1960.

P-47D field maintenance during World War II

Shown here is maintenance being conducted on a giant B-36 heavy bomber. Developed in the 1940's, the propeller-driven B-36 gave way to newer turbojet-powered aircraft like the B-47 and the B-52.

The ADM-20 Quail missile, here undergoing repair at Oklahoma City in 1962, was to serve as a decoy to confuse enemy radar tracking US bombers.

Shown here is field maintenance being conducted on a P-47D based in the southwest Pacific during World War II.

The AGM-28 Hound Dog guided missile, designed to be launched from a B-52 against distant enemy targets, became operational in 1960. Here is the modification line at Oklahoma City.

A Strategic Air Command KC-97 refuels a B-47 Stratofortress in mid-flight. This technique gave the USAF a global reach capability in the early 1950's.

A giant C-5 Galaxy transport prepares to load cargo in support of a deployment.

High priority cargo for the Korean front: a jet engine is loaded aboard a C-54 "Skymaster." The engine will be landed at a base near the combat zone for immediate installation in one the Fifth Air Force's jet fighters.

An airman mechanic in training gains "hands on" learning experience under the watchful eye of her instructor. The instructor has a technical order in hand to ensure everything goes by the book .

Movement of cargo is simplified by the use of standardized pallets, straps and nets. Here, a ground support vehicle with a fully-loaded 463L pallet approaches a cargo aircraft.

Hydraulic landing gear assemblies are complex subsystems that require detailed regular inspection, as depicted in this photograph.

By the late 1970's, test equipment such as this central air data computer had been introduced to the flight line, enabling maintenance crews to make rapid check of the complex avionic components.

Jet engines produce tremendous heat and exhaust pressure. In this photograph, a technician examines the exhaust nozzle on an F-15's F100 turbofan engine.

This T-33 training hulk is being repaired by aircraft battle damage repair technicians from the 2952d Combat Logistics Support Squadron at Hill Air Force Base. This type of training prepares combat maintenance teams for aircraft repair under battle conditions.

Depot maintenance at Ogden air Logistics Center at Hill AFB, Utah on an A-10 "Warthog"

Aircraft tail stabilizers are subjected to tremendous stress and therefore require regular inspection and repair to maintain their structural integrity. With a B-1B horizontal stabilizer secured to a jig, Oklahoma Air Logistics Center technicians work on the spars.

While greatly simplified by the use of standardized pallets and roll-on roll-off floors, moving cargo onto an aircraft and properly securing it in place still requires the team effort of skilled loadmasters and crews.

USAF aircraft are extremely sophisticated machines which must receive complete periodic overhaul. This work is performed at one of the Air Force's air logistics centers or at a contractor facility. These F-16s are undergoing programmed depot maintenance at the Ogden Air Logistics Center.

Aircraft wings house a complex assortment of electrical components, hydraulic components and fuel cells. Here, technicians perform work on the flight control system.

The C-17 is the USAF's newest heavy airlifter. Its capability is illustrated by the mix of Army Humvees, trucks and tracked artillery piece, shown in this photograph, which can be carried simultaneously aboard the aircraft.

Tinker's first "lean cell" shop has been set up to repair the F110-400 first-stage low-pressure turbine nozzles. These critical aircraft components used to travel more than nine miles between three shops. Creating the lean cell has reduced the maintenance journey to only 1.5 miles, and the number of travel days were cut by 80 percent.

Unmanned aerial vehicles are being procured by the Air Force in increasing numbers to fill an expanding variety of roles. Here, an RQ-1 Predator surveillance aircraft receives flight-line maintenance.